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# 1. General Information

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In today's world, where new chemicals are constantly being developed and established chemicals are steadily being released, concern is mounting over the impact these chemicals may have on our health and our environment.

Gathering all the available information about a chemical is the first step in assessing the impact. This information is, however, often incomplete and many gaps must be filled in this body of information before any conclusions about the chemical can be made. The U.S. Environmental Protection Agency (EPA) can sometimes do this by sending teams into the lab or out into the field, but rarely do we have the resources to do this early in the evaluation process. Alternatively, we can fill in the information gaps by using techniques designed to estimate or predict the missing pieces.

It is important to know the nature of a chemical and its effect on the environment. Generating this information through analyses of chemical behavior and the predictive modeling of chemical releases and exposure patterns is the job of the Economics, Exposure, and Technology Division (EETD) in the Office of Pollution Prevention and Toxics (OPPT) of EPA. One of the major tools used by OPPT to estimate chemical properties and model the results of chemical releases is the Graphical Exposure Modeling System (GEMS).

### *GEMS*

GEMS is an operating environment. It houses a variety of programs that allow you to:

1. Access pertinent supporting data for exposure assessment studies such as population from the 1990 Census Population Block dataset.
2. Estimate a number of important environmental and chemical properties for chemicals lacking the necessary measured values (which is often the case).
3. Model the spread of the chemical across the various strata of environments in an ecosystem.
4. Produce exposure assessments for the populations being studied using the results gained from modeling.
5. Represent the results graphically in a variety of different formats from barcharts to isopleths to geographical maps.

GEMS resides on the VAX Cluster of computers maintained by the EPA at Research Triangle Park, North Carolina. The VAX Cluster consists of one VAX 8600, one VAX 8650, and one VAX 11/785. To use GEMS, you must have an account on the VAX Cluster and have access to a computer terminal with dial-up lines.

### *PCGEMS*

This, unfortunately, limits the accessibility of GEMS. A Personal Computer (PC) version of GEMS, called PCGEMS, was created by EPA containing most of the features of GEMS.

PCGEMS increases the accessibility of GEMS programs since it is designed to work on IBM PC compatible computers. PCGEMS is also able to work interactively with GEMS, if the user has access to the VAX Cluster and has a modem for the personal computer, allowing the resources of GEMS to be used in conjunction with the adaptability and accessibility of the 486 machine.

In addition, PCGEMS is able to incorporate other PC programs into the PCGEMS

system, thus allowing for an entire library of related environmental assessment software to be incorporated under one system. To support and manage all the data that is generated using these tools, PCGEMS contains a catalog manager as well as file conversion programs. These programs transform PCGEMS' data files to DIF, dBASE and LOTUS 1-2-3 formats so that other commercial software may be used to manage and analyze data.

#### *Who Uses PCGEMS?*

PCGEMS was designed to further serve the OPPT in evaluating the exposures and risks presented by the releases of chemical substances. OPPT uses this information in carrying out the mandates described in Sections 4, 5, and 6 of the Toxic Substances Control Act.

In addition, PCGEMS has proven itself valuable to state and local environmental agencies for their use in evaluating the chemical release information made available under the Emergency Planning and Community Right-to-Know Act of 1986 (Title III of the Superfund Amendments and Reauthorization Act). PCGEMS is being used by a broad spectrum of users, including corporations, universities, environmental consultants, and public interest groups.

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## 1.1 GEMS and PCGEMS: Interactive Relationship

PCGEMS allows access to GEMS using the MS-KERMIT terminal emulation software which has been incorporated into PCGEMS. This ability to communicate with GEMS is provided for one important reason: although PCGEMS contains most of the features of GEMS, it lacks certain important features owing to the limitations of space and power on the personal computer. The features which are not available in PCGEMS include the following:

1. A number of large datasets that cannot be transferred to PCGEMS, due to security or proprietary limitations.
2. Several environmental models, such as the GEMS Atmospheric Modeling Subsystem (GAMS), that are currently too sophisticated and consume too much space to be feasible on the personal computer.

3. The ability to scan datasets that are so large that a data management program on the PC can read only portions of the data at a time, such as the Reach Trace Dataset.

In order to use any of the programs or datasets named above, GEMS must be used. You may use GEMS through PCGEMS provided you have a GEMS account, a modem, and access to a telephone line.

Once the portion of your work performed on GEMS is complete and you have extracted the data or results that you were looking for, you can download the results from your GEMS directory using KERMIT. You can use the data downloaded as input for some of the modeling programs in PCGEMS. For further information on KERMIT and how to use it, refer to Chapter 6, "Communications."

The Catalog Manager Program (also called the catalog manager) allows you to view the contents of these downloaded files. However, the output function available in the Catalog Manager Program does not allow you to edit these files. To edit downloaded files, you can install any data editor in PCGEMS. For more information on all of the data management options, refer to Chapter 4, "Data Management."

Such interaction with GEMS provides users with all the power of the VAX Cluster with the flexibility of a PC. All interaction with GEMS using PCGEMS presupposes that you have an account on GEMS. If you need instructions on opening an account, contact:

*Ms. Cathy Turner at (202) 260-3929*

For further information on logon programs and telephone access to GEMS, refer to the most recent *GEMS User's Guide*.

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## 1.2 Minimum System Requirements

In order to work, PCGEMS needs the following items:

- IBM XT/AT or compatible with 640 K RAM
- Hard Disk and 1 floppy disk drive.
- DOS Version 2.2 or a higher version of DOS
- Graphics display adapter.
- 580 K RAM available at all times

Since the system is so highly memory-intensive, we strongly recommend that you have no memory-resident programs on your PC. Also, PCGEMS will not work on a network.

To communicate with GEMS on the VAX Cluster, you also need:

- 1200 or 2400 baud modem.
- Serial port for use with the modem.

Optional hardware includes:

- 8087, 80287 or 80387 Math Co-Processor (Although PCGEMS does not require a math co-processor, the number of calculations required by some of the models means that a co-processor is highly recommended.)
- Bernoulli Box (If you are planning to load PCGEMS on a Bernoulli disk instead of a fixed hard drive.)
- IBM Graphics-compatible printer (If you want to make hard copies of PCGEMS graphics or text files.)
- Parallel port for use with the printer

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## 1.3 Loading PCGEMS

Three steps are required to fully load PCGEMS.

*Step 1: Installing PCGEMS System Disks on the DOS File Path*

- ▶ Identify and separate SYSTEM Disks #1, #2, and #3 from the remainder of the disks.

These disks are the system drivers necessary to run all the other programs and must be loaded on the hard disk. The directory to which you copy the files on these disks needs to be specified on the file path of the AUTOEXEC.BAT file.

- ▶ Load SYSTEM disks on the hard disk.

To load the system disks, first create a directory on the hard disk. (If you are loading the SYSTEM disks into an existing directory, skip this step.) You may load the SYSTEM disks on any directory, even the root directory. However, we recommend that you keep files separate from the SYSTEM disks in a specific subdirectory called PCGEMS to help keep the system organized. Enter:

```
C:\>MD PCGEMS
```

Always leave a space between the “MD” and “PCGEMS”.

- ▶ Proceed to the directory you have created. This is the directory into which you will install the SYSTEM disks. Enter:

```
C:\>CD PCGEMS
```

- ▶ Copy the contents of the disks into the directory:
  1. Insert the disks in drive A or drive B.
  2. Enter the DOS COPY command:

```
C:\PCGEMS>COPY A:*.*
```

3. Repeat this last command for the remaining two disks.

- ▶ Enter the directory name in the DOS path statement in the AUTOEXEC.BAT file.

The AUTOEXEC.BAT file is a special type of batch file that DOS looks for when you start your computer. If DOS finds AUTOEXEC.BAT in the root directory, it executes the statements it finds there. While not absolutely necessary, most computers have an AUTOEXEC.BAT file. If your computer lacks one, create the file in the root directory of the disk from which you start DOS (usually C:), using a DOS file editor or word processor with a non-document mode. In this file, you should have a path statement with the PCGEMS directory in it, similar to the example below:

```
PATH=C:\PCGEMS
```

If the AUTOEXEC.BAT file already exists on your root directory, modify the path statement in the file to include the PCGEMS directory using the same format as shown above. Remember, if you are modifying an existing path statement, to always have a semicolon (;) separating the PCGEMS directory from the others, for example: "PATH=C:\DOS;C:\PCGEMS;".

**NOTE:** Only the directory with the files from SYSTEM disks should be in the path statement (with regard to PCGEMS).

- ▶ Activate the new AUTOEXEC.BAT file:
  1. Enter "AUTOEXEC". The batch file will run again.
  2. Reboot the computer by either pressing the ALT, CTRL, and DEL keys simultaneously, OR by turning the PC off and turning it on after 30 seconds.

The new path statement is now in effect and you can now execute PCGEMS from anywhere in the computer, in any directory or drive, by simply typing "PCGEMS". This completes STEP 1.

#### *Step 2: Loading Programs*

Once the PCGEMS directory is inserted in the path statement, you should load the programs you plan to use often in appropriate subdirectories on either your hard disk or on Bernoulli disks.

- ▶ Load the PCGEMS programs you plan to use onto the hard disk (or onto Bernoulli disks). A program is loaded by copying the files from the program disks onto the appropriate subdirectory. Keep the original disks in a safe place to use as back-ups.

A menu tree of all the programs in PCGEMS is provided on page 1-11 along with a short description of each program's basic function to help you arrange your subdirectories. All the disks that make up a single program are listed after the definition. If you decide to load a specific program, you must load all the disks that constitute the program to make it run. *Refer to the appropriate section of this user's guide devoted to each program for more information on the programs you can load.*

#### *Creating Subdirectories in PCGEMS*

Keep in mind that the program path statement in the PCGEMS configuration file is only 80 characters wide, and all the program directories must be in it. Do not create a separate subdirectory for every single program. We advise placing programs performing similar functions, such as all the programs performing utility functions, in the same subdirectory.

Specific subdirectories can be made for the Modeling and Chemical Property Estimation programs that make up the heart of the PCGEMS system. If there is a program that you consider especially important, such as ISC2LT, and you plan to perform many modeling runs with the program, resulting in many output files, we recommend that you create a separate subdirectory for it to help in file management. To create a program or dataset directory, use the same commands given in STEP 1 (but **do not** put the directory in the AUTOEXEC.BAT file path). A directory tree is provided below to illustrate this arrangement of directories.

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## DIRECTORY TREE

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<u>DIRECTORY</u>	<u>DESCRIPTION OF CONTENTS</u>
C:\EST	For chemical property estimation programs.
C:\MODEL	For environmental modeling programs.
C:\DM	For data management programs.
C:\UTIL	For utility programs.



<i>C:\DATA</i>	For small datasets in the system, such as STAR, ZIPCODE, and CAS Number/SMILES.
<i>D:\GRAPH</i>	For graphical programs. The D: drive in this case is assumed to be a Bernoulli disk drive. The graphical programs are copied to a Bernoulli drive since it is assumed, for the sake of this example, that the graphical programs will not be used as often as the other programs. In your case, it might be a different set of programs that you think you will not be using as often as you would the other programs and will put in drive D:.

**NOTE:** There is no need to have a separate subdirectory for the communications options in PCGEMS since the Run MS-KERMIT Program is part of the SYSTEM disks and should be in your PCGEMS directory.

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The menu tree provided below refers to PCGEMS programs by their abbreviated names. These abbreviated program names are the names by which the programs are referred to on the disk labels. In the menus where the programs are listed, the actual name will be given, along with the abbreviated names as given below. In this user's guide, the programs will usually be referred to by their abbreviated names. Any dataset used by these programs will also be listed accordingly.

#### *CORE System Programs*

In addition to the SYSTEM disks that are crucial to running PCGEMS, there are a number of other classes of programs, such as file management and communication, that provide support necessary to run PCGEMS. These programs together are considered the CORE system of PCGEMS. These CORE programs are designated in the menu tree below.

While it is not absolutely necessary, we recommend that you install these other CORE programs on the hard disk. Most of the CORE programs do not take up much disk space. The disks that are listed for each program are for the basic version of PCGEMS as stored on 360 K double density disks. For versions of PCGEMS that are on 1.2 Mb high density disks or on 3.5 inch 720 K disks, although the number of

disks will differ, the disk names listed below will remain the same. The disk names will be listed on the disk label even if two or more disks are combined on a single floppy disk. For example, the high density version of the SYSTEM disks will be labeled "SYSTEM Disks #1, 2 & 3".

**NOTE:** For the PCGEMS version on Bernoulli disks, the programs have been loaded on to the Bernoulli cartridges under the directory names given in the directory tree above.

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## MENU TREE

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► *ESTIMATION*

*SMIGET*

A program that retrieves the SMILES notations when the CAS number for the chemical is provided. This program requires access to the CAS Number/SMILES dataset.

DISKS: SMIGET

*TITLE III*

A program that locates and retrieves any available measured or estimated values for a chemical if the chemical is in the TITLE III dataset. If the chemical is not in the dataset, the program will retrieve the SMILES notation when the CAS number for the chemical is provided. This program requires access to the TITLE III dataset and the CAS Number/SMILES dataset.

DISKS: SMIGET

*PCLOGP*

A property estimation program that estimates the octanol/water partition coefficient value for a chemical. This program requires the CAS Number/SMILES dataset.

DISKS: PCLOGP DISK #1

PCLOGP DISK #2

*PCCHEM*

A property estimation program that estimates seven chemical properties for a chemical using a minimum of input data. This program uses the GEMS CHEMEST dataset.

DISKS: PCCHEM DISK #1

PCCHEM DISK #2

*PCHYDRO*

A property estimation program that estimates the rate of hydrolysis for a chemical.

DISKS: PCHYDRO DISK #1

PCHYDRO DISK #2

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**MENU TREE (continued)**

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<i>PCFAP</i>	<p>A property estimation program that estimates the rate of atmospheric oxidation of a chemical.</p> <p>DISKS:    PCFAP</p>
<i>DRAWSMI</i>	<p>A program that draws the structure of a chemical when provided with the SMILES notation of the chemical. In addition, this program will also draw the chemical structure when provided with the CAS number of those chemicals that are in the CAS Number/SMILES database.</p> <p>This program requires access to the TITLE III dataset and the CAS Number/SMILES dataset.</p> <p>DISKS:    SMIGET</p>
<p>► <i>ENVIRONMENTAL MODELING</i></p>	
<i>ISCLT</i>	<p>Air model that calculates annual ground-level concentration or deposition values and estimates exposure and risk using these values. The model uses the STAR, Zipcode and Census Block and Block Group datasets.</p> <p>DISKS:    BUILDISC            EXPRISK               RUNISC DISK #1        ISCGRAPH               RUNISC DISK #2        TERRAIN</p>
<i>PTPLU</i>	<p>Gaussian plume dispersion model that estimates the location of the maximum short-term concentration in the atmosphere from a single point source.</p> <p>DISKS:    PTPLU</p>
<i>SESOIL</i>	<p>Model that estimates the rate of vertical chemical transport and transformation in the soil column (unsaturated zone).</p> <p>DISKS:    SEBUILD DISK #1    SERUN DISK #1               SEBUILD DISK #2    SERUN DISK #2               SEGRAPH            SEATLINK</p>

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**MENU TREE (continued)**

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*AT123D*                      Model that predicts the spread of a contaminant plume through groundwater (saturated zone).  
                                 DISKS:    BUILD123                      ATISO  
                                                      PCAT123D

*EXAMS-II*                      This model simulates the fate of organic chemicals in surface water bodies.  
                                 DISKS:    EXCHEM                      RUNEX DISK #3  
                                                      EXLOAD                      RUNEX DISK #4  
                                                      ENVTEMP                      RUNEX DISK #5  
                                                      RUNEX DISK #1    RUNEX DISK #6  
                                                      RUNEX DISK #2    EXGRAPH

**NOTE:** In the list of disks given for EXAMS-II above, the RUNEX portion of this program is carried on six separate disks. This is because EXAMS-II is extremely large, and the executable code will not fit on a single disk. To use EXAMS-II, you must concatenate the executable code, after the program is copied to the hard disk, by typing "EXINSTAL" to the subdirectory where the EXAMS-II program files have been copied. In order to run the concatenation procedure, you must have at least 1.2 Mb of space available on the hard disk after the program has been installed. The program is ready to be used once "EXINSTAL" has been added.

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**MENU TREE (continued)**

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*REACHSCAN*      A surface water model that estimates steady-state chemical concentration in surface water bodies. This program requires the ReachScan dataset.

DISKS:      REACHSCAN DISK #1  
             REACHSCAN DISK #2

**NOTE:** The ReachScan Model must have the ANSI.SYS device driver in the CONFIG.SYS in order to work. If the device driver has not been entered previously, include the command "DEVICE=ANSI.SYS" in the CONFIG.SYS file with either a data editor or a word processing package in a non-document mode. Remember to check your DOS directory to make sure the ANSI.SYS driver exists there before entering the command.

*ENPART*      This multi-media model estimates equilibrium concentration ratios of a chemical between the environmental compartments of air, water, and soil.

DISKS:      BUILDENP  
             PCENPART

► *DATA  
MANAGEMENT  
T (PART OF  
THE CORE  
SYSTEM)*

*CENSUS*      A data retrieval program that retrieves population and other data from the Census Block and Block Group datasets.

DISKS:      CENSUS

*XDIR*      A data retrieval program that allows you to list the files on

any directory or drive. Similar to DOS DIR command.

DISKS: XDIR

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**MENU TREE (continued)**

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*XEDITOR*            A data retrieval program that installs a data editor under the PCGEMS environment so that you may manipulate PCGEMS output files.

DISKS:    XEDITOR

*XEDTFILE*           You use this program to actually edit a file under the PCGEMS environment.

DISKS:    XEDTFILE

*XFORMAT*           A data retrieval program that allows you to convert ASCII files into three different formats so that the files may be used by other commercial software.

DISKS:    ASC2LOT

ASC2DB

ASC2DIF

*CATMGR*            A multi-task program that allows you to organize and list the many output and input files that PCGEMS generates and needs.

DISKS:    None. Part of SYSTEM Disk #3.

► *GRAPHICS*

*ROSE*                A graphics program that allows you to visually represent the distribution and speed of wind patterns. This program requires access to the STAR and Zipcode datasets.

DISKS:    ROSE



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## MENU TREE (continued)

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*GENMAP* A mapping program that allows you to draw high-quality maps at various spatial scales depicting county, state, and EPA region boundaries. Overlay and choropleth maps can be generated including the ability to overlay the locations of meteorological stations, Census Blocks and Block Groups, river reaches, stored data with corresponding geographical location and manually input data.

This option requires access to the Geographic Mapping Boundary datasets: US, REGION, COUNTIES, STATE, FIPS, as well as the Zipcode dataset, STAR, Census Block, Census Block Group, and Reach Trace (if you wish to overlay weather stations, population, or river reaches).

DISKS: GENMAP #1  
GENMAP #2  
GENMAP #3

► *COMMUNICATIONS (PART OF CORE SYSTEM)*

*MS-KERMIT* A communication program that runs the MS-KERMIT terminal emulation program.

DISK: None. Part of the SYSTEM disks.

► *UTILITIES (PART OF CORE SYSTEM)*

*CRFIG* A utility program that allows users to change PCGEMS Configuration File.

DISKS: None. Part of the SYSTEM disks

*XINSTALL* A utility program that allows users to install a non-PCGEMS program under the PCGEMS environment.

DISKS: XINSTALL

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**MENU TREE (continued)**

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<i>XRUN</i>	A utility program that allows users to run a NON- PCGEMS program under the PCGEMS environment temporarily. DISKS:    XRUN
<i>XRUNNPC</i>	A utility program that allows users to run a non-PCGEMS program under the PCGEMS environment after it is installed using XINSTALL. DISKS:    XRUNNPC
<i>DXDYCALC</i>	A utility program that is meant to help you calculate the source X and source Y coordinates in meters relative to the primary source. The X and Y coordinates are the DX and DY parameters that are required in the ISCLT model input file. DISKS:    DXDYCALC

**NOTE:** Certain PCGEMS programs such as XINSTALL and XRUN are relatively small programs and may be on the same disk as other programs. If you wish to load that program from the disk and not the other programs, refer to Appendix B to see a list of the files that make up a single disk. Load only those PCGEMS programs you plan to use often.

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The PCGEMS datasets, some of which have been mentioned in the menu tree above, and the programs they support, are shown separately in the list below. The programs that use the datasets are also included. You may create separate directories for the datasets using the same process outlined in STEP 1. (You can have some of the smaller datasets in the same directory). For greater detail on these datasets, refer to Chapter 8, "PCGEMS Datasets."

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## PCGEMS DATASETS

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<i>Census Block</i>	Currently used by ISCLT, CENSUS, and the General Geographic Mapping Program.												
<i>Census Block Group Population</i>	Currently used by ISCLT, CENSUS and the General Geographic Mapping Package												
<i>GEMS CHEMEST</i>	Used by the PCCHEM program. Contains measured values for a variety of chemicals.												
<i>Geographic Mapping Boundary</i>	Used by the Geographic Mapping procedure, includes various boundary datasets and lookup tables; they will not be addressed separately since we recommend you load them all at the same time and keep them all in the same directory if you plan to use the Geographic Mapping program. The datasets, which are fairly small, are shown below:												
	<table> <tr> <th><u>NAME</u></th><th><u>CONTENTS</u></th></tr> <tr> <td><i>US.BIN</i></td><td>Boundaries of contiguous U.S.</td></tr> <tr> <td><i>REGION.BIN</i></td><td>Boundaries of EPA regions.</td></tr> <tr> <td><i>STATES.BIN</i></td><td>Boundaries of all the states, except Hawaii and Alaska.</td></tr> <tr> <td><i>COUNTIES.BIN</i></td><td>Boundaries of all the counties in the contiguous United States.</td></tr> <tr> <td><i>FIPS.BIN</i></td><td>State and county Federal Information Processing Standards (FIPS) codes for all the counties and states in the U.S.</td></tr> </table>	<u>NAME</u>	<u>CONTENTS</u>	<i>US.BIN</i>	Boundaries of contiguous U.S.	<i>REGION.BIN</i>	Boundaries of EPA regions.	<i>STATES.BIN</i>	Boundaries of all the states, except Hawaii and Alaska.	<i>COUNTIES.BIN</i>	Boundaries of all the counties in the contiguous United States.	<i>FIPS.BIN</i>	State and county Federal Information Processing Standards (FIPS) codes for all the counties and states in the U.S.
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<i>FIPS.BIN</i>	State and county Federal Information Processing Standards (FIPS) codes for all the counties and states in the U.S.												
<i>Reach Trace</i>	Used by the Geographic Mapping program to draw river reaches. This is a very large dataset. We do not recommend loading it on the hard disk as it will take up almost 40 Megabytes of space.												

<i>CAS Number/ SMILES</i>	Used by SMIGET and PCLOGP.
<i>STAR</i>	Used by the ROSE program, the Geographical Mapping Program, and the ISCLT program. The dataset consists of two separate files, STAR.BIN, which contains the frequencies of wind direction by wind speed classes by atmospheric stability category and XAUXIL.BIN. Before you can use STAR.BIN, you must run the STARINST.EXE program which concatenates the two halves of this file into one piece. When you have copied the contents of the two STAR disks onto the hard disk, type "STARINST" and the dataset will be concatenated.
<i>Zipcode</i>	Used by the ISCLT program, ROSE program and Geographical Mapping program.
<i>ReachScan</i>	Used by the ReachScan program.

The creation of directories is an ongoing process. You may delete and add subdirectories (or programs) as you go continue to use the system and discover the best ways to work with it. Remember that the entire system consumes almost 19 Mb of space and that you will not be using all the programs all the time. We recommend that you subtract and add directories as you become familiar with the programs and how you are using them. If you wish to delete a program from a directory with a lot of programs, or if you simply want to move a program from one directory to another, you need to move all the files that make up the program. The list of files that make up every program is given in Appendix B. Refer to it.

- ▶ STEP 2 is complete when you have created the directories.

#### *Step 3. Creating a Configuration File and Saving Output Files*

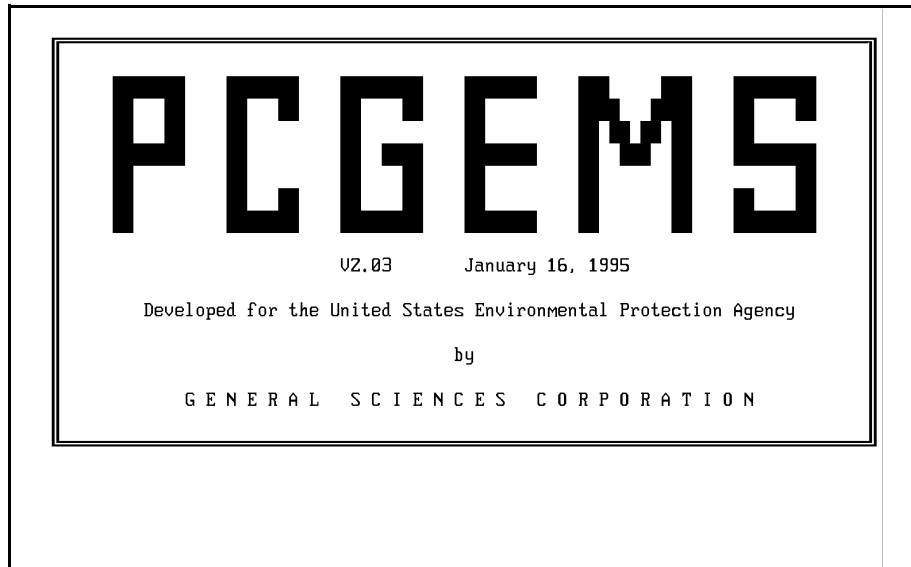
- ▶ Start PCGEMS.

You are now ready to start PCGEMS. Although you may run PCGEMS from any

directory or subdirectory, you must be in the one in which you would like the output files from this session to be stored to **before** you start PCGEMS. Once you are in PCGEMS, you cannot change to a different subdirectory. This is important if you wish to use output files created by one program as input for another, which is often the case in PCGEMS. You must be in the right directory to access them to use as input. We suggest that, as in the case of the PCGEMS programs, you create separate directories for the output or use the same directories that you created for the programs. Care should be taken when invoking PCGEMS and rigorous housekeeping standards should be maintained, since PCGEMS creates a large number of output files. Otherwise, you will have problems later in finding and accessing output files and catalog files. When you are in the directory or subdirectory in which you would like the output files to be stored, enter the PCGEMS start command, "**PCGEMS.**"

- ▶ Create the PCGEMS configuration file.

When you have entered the PCGEMS start command, you will first see the system herald shown in Figure 1-1.



*Figure 1-1. System Herald*

The menu shown in Figure 1-2 appears next. The menus in Figures 1-2 through 1-5 appear only when you first load PCGEMS, to assist you in creating the PCGEMS configuration file. Once your PCGEMS configuration file is created PCGEMS will use that configuration file automatically without prompting you for it at every session. PCGEMS has an utility program available under the Utilities option that allows you to edit the configuration file if necessary. (Refer to Subsection 7.2 for information).

GRAPHICAL EXPOSURE MODELING SYSTEM	V2.0	OCT 1, 1994	DRIVE: S
<div>SELECTION OF GRAPHICS CARD</div> <div>1. HERCULES 720X348 Black/White Text Only (***NOTE: PCGEMS graphics will not display on HERCULES card)</div> <div>2. CGA 640X200 Black/White Graphics, Color text (***NOTE: PCGEMS only produces black/white graphics on CGA)</div> <div>3. EGA 640X350 Color Graphics and Text</div>			
<div>Use numbers or UP/DOWN arrow keys to highlight selection.</div> <div>Press the ENTER key to proceed to next menu or operation.</div>			
F1:HELP F2:CMDS F3:LIST F9:BACK F10:NEXT PgUp/PgDn:PAGE Alt-F10:END Esc:EXIT			

Figure 1-2. Selection of Graphics Mode Menu

Identify the graphics adapter card that you have by moving the cursor to the appropriate selection and pressing the ENTER key. The graphics output in PCGEMS was developed specifically for Enhanced Graphic Adapter (EGA) monitors. However, the graphics output can be displayed on a Color Graphics Adapter (CGA) monitor but will be shown in black and white since PCGEMS needs the greater resolution. (The menus will be shown in color.) The resolution for the CGA monitor is 640X200.

No graphics can be generated with the Hercules card. All PCGEMS routines will operate with this adapter but no graphics output will be generated to the screen. Output graphs can be viewed by copying the graphics output files (all files with a .GRP extension) to a PC with CGA or EGA cards. If you have an EGA monitor, the graphics output may have up to 15 colors with a dark background. The screen resolution is 640X350.

The menu in Figure 1-3 appears next. This screen is crucial in the creation of the PCGEMS configuration file for, if you make a mistake entering the paths required here, you will not be able to access or use PCGEMS programs or datasets.

GRAPHICAL EXPOSURE MODELING SYSTEM	V2.0	OCT 1, 1994	DRIVE: S
PROGRAM AND DATA PATH MENU			
Programs Path			
Data Path			
Use UP/DOWN keys to select parameter, RIGHT/LEFT to edit. Use the BACK SPACE key to delete the previous character. Press the ENTER key to proceed to next menu or operation.			
F1:HELP F2:CMDS F3:LIST F9:BACK F10:NEXT PgUp/PgDn:PAGE Alt-F10:END Esc:EXIT			

Figure 1-3. Path Specification Menu

Each of the prompts in the Path Specification Menu is explained in greater detail below:

#### *Program Path*

This is the statement that identifies the paths to the PCGEMS programs. It is similar to the AUTOEXEC.BAT file path statement you modified earlier in STEP 1, except that it is exclusive to PCGEMS. When running a program PCGEMS will search the directories in the exact order that you specify here. Enter the directories that you created in STEP 2 according to how often you plan to use them. Directories containing programs that you plan to use often should be entered before directories containing programs that you do not plan to use often. This is because PCGEMS will search the directories in the order listed here looking for the program that you choose. If the directory containing the program is at the end of the path statement, PCGEMS will take a little more time to find and access it.

To show you how to enter the program path, an example of a path is given below. In the arrangement of directories, we will assume that you followed the suggestion made earlier and arranged the directories according to function. You plan to use the modeling programs the most and you plan to use the data management programs more than the graphics and utility programs. Therefore, you should enter your



program path like this:

```
C:\MODEL;C:\EST;C:\DM;C:\UTIL;D:\GRAPH;
```

You should always have a semicolon(;) separating one directory from the other. In entering your directories in the program path, substitute the names and locations of your directories, using the same logic as that gone through above. Remember that you can always change it later on, using the CRFIG utility program, if you are dissatisfied with the arrangement or have new directories to add to it. If you are planning to enter a Bernoulli drive on the path, always have it at the end of the path for if, there is a problem with your Bernoulli drive, PCGEMS will not work. We strongly recommend that you **do not** run programs from the floppy disk drives (A: or B:).

#### *Data Path*

The data path is similar to the program path and follows the same rules. Arrange the directories according to frequency of usage. An example data path is shown below:

```
C:\CENSUS;C:\DATA;C:\REACH;
```

When you have entered all the information required by the Path Specification menu, press ENTER. The menu in Figure 1-4 appears next if you selected either CGA or EGA graphic mode. This menu consists of two “pages” so when you are through with the first “page”, enter the PgDn function key to move to the next “page” and you will see the menu in Figure 1-5. If you selected Hercules mode, you will not see either of these menus. Instead you will go directly to the main PCGEMS navigational menu shown in Figure 1-6.

GRAPHICAL EXPOSURE MODELING SYSTEM		V2.0	OCT 1, 1994	DRIVE: S
SCREEN COLORS				
		Page 1 of 2		
ITEM	COLOR			
-----	-----			
System Title Foreground	LIGHT-GREEN			
System Title Background	BLACK			
Main Window Foreground	YELLOW			
Main Window Background	CYAN			
Error Window Foreground	WHITE			
Error Window Background	RED			
Instruction Window Foreground	WHITE			
Instruction Window Background	BLUE			
Function Key Foreground	LIGHT-RED			
Function Key Background	BLACK			
<p>Use arrow keys to select the array element to edit, and            Tab/Shift-Tab to move to the right and left data fields.            Press the ENTER key to proceed to next menu or operation.</p>				
F1:HELP F2:CMDS F3:LIST F9:BACK F10:NEXT PgUp/PgDn:PAGE Alt-F10:END Esc:EXIT				

Figure 1-4. Color Specification Menu - Page 1

GRAPHICAL EXPOSURE MODELING SYSTEM		V2.0	OCT 1, 1994	DRIVE: S
SCREEN COLORS				
		Page 2 of 2		
ITEM	COLOR			
-----	-----			
Function Key Description Foreground	WHITE			
Function Key Description Background	GREEN			
Highlighted Item Foreground	WHITE			
Highlighted Item Background	BLACK			
Edited Item Attribute	WHITE			
Default Values Attribute	BLACK			
Help Window Foreground	WHITE			
Help Window Background	RED			
<p>Use arrow keys to select the array element to edit, and            Tab/Shift-Tab to move to the right and left data fields.            Press the ENTER key to proceed to next menu or operation.</p>				
F1:HELP F2:CMDS F3:LIST F9:BACK F10:NEXT PgUp/PgDn:PAGE Alt-F10:END Esc:EXIT				

Figure 1-5. Color Specifications Menu - Page 2

The two menus in Figures 1-4 and 1-5 allow you to choose screen colors. If you have a CGA or EGA graphics card and a color monitor, you have the choice of sixteen colors which you may use:

BLACK	RED	DARK GRAY	LIGHT RED
BLUE	MAGENTA	LIGHT BLUE	LIGHT MAGENTA
GREEN	BROWN	LIGHT GREEN	YELLOW
CYAN	LIGHT GRAY	LIGHT CYAN	WHITE

**NOTE:** You cannot select light colors such as light green or light cyan for any of the background sections of the menu screen.

There are a few rules of thumb that you should keep in mind when assigning colors:

1. Contrast is all-important when it comes to showing text on a screen clearly. The PCGEMS menu design and the main sections referred to in the menus above (e.g. error window, instruction window) are shown and explained in Subsection 1.4. The sections of the screen that contain text are given below:

- SYSTEM TITLE FOREGROUND
- MAIN WINDOW FOREGROUND
- ERROR WINDOW FOREGROUND
- INSTRUCTION WINDOW FOREGROUND
- FUNCTION KEY FOREGROUND
- FUNCTION KEY DESCRIPTION FOREGROUND
- HIGHLIGHT FOREGROUND
- EDITED ITEM ATTRIBUTE
- DEFAULT VALUES ATTRIBUTE
- HELP WINDOW FOREGROUND

When assigning colors to any of the sections above, keep in mind that the selected color should stand out clearly against its background. For example, if you pick dark gray for the MAIN WINDOW BACKGROUND, you should pick a color that will stand out clearly against a dark gray background, such as yellow. For the EDITED ITEM ATTRIBUTE and the DEFAULT VALUES ATTRIBUTE, the background color is the color selected for the MAIN WINDOW BACKGROUND.

2. Remember to pick colors that are soothing, such as light gray. If you are planning to use PCGEMS for long stretches of time, colors such as brown and

light magenta can tire the eyes (although, as in all such things, colors are a matter of taste).

When you are finished assigning colors, press ENTER and you will be taken to the main PCGEMS menu shown in Figure 1- 6. If you chose to assign colors, instead of accepting the defaults, and do not like the colors that you chose, you will have to edit the configuration file. Go to Subsection 7.2 for instructions to do this.

- ▶ When you are returned to the main PCGEMS menu level, you have completed the loading and are ready to begin using PCGEMS.

---

## 1.4 Starting PCGEMS from the Hard Disk

Once you have followed the three steps outlined in Subsection 1.3, you can access PCGEMS from any drive or subdirectory in your PC system. The important thing to remember before accessing PCGEMS is that you should be in the directory or subdirectory in which you would like the output files to reside before starting PCGEMS. The command to start PCGEMS is **“PCGEMS”**.

---

## 1.5 Menu Design

In general, there are four types of menus in PCGEMS: navigational menus, parameter editing menus, array editing menus, and table selection menus. All of these menus have the same design. The only difference is the type of user input that is required. The basic menu design will be explained first, followed by examples of the four menu types.

All menu screens in PCGEMS are divided into five sections. Each section imparts a different type of information. This division means that you will always know where to look to find system commands or other system information, and that you will know what kind of information the system is sending you just by where it occurs on the screen. An example of a navigational menu is shown below in Figure 1-6. It is the main navigational menu in PCGEMS. The various sections of the menu is

identified by letter (A - E) and their descriptions are provided below.

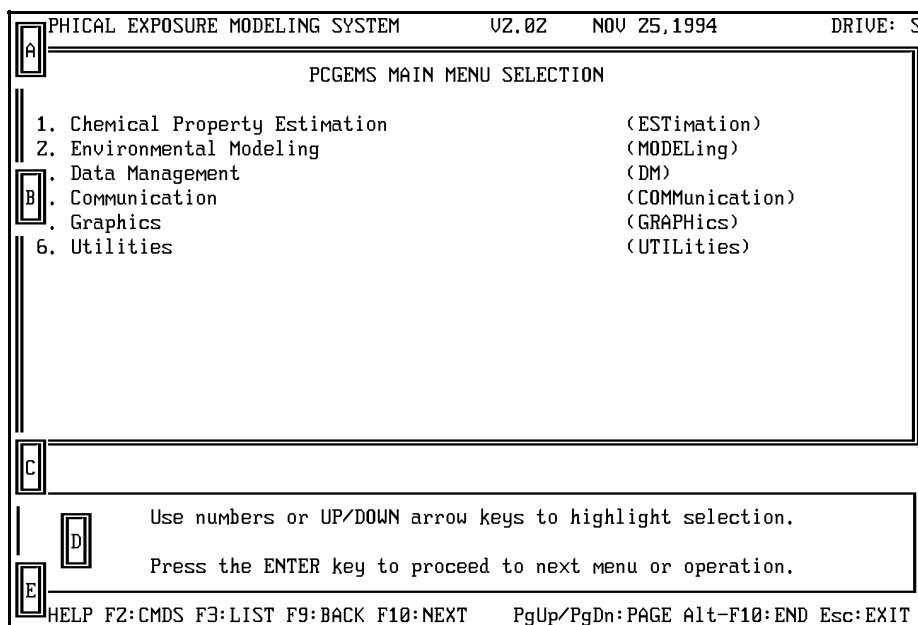


Figure 1-6. Example of PCGEMS Menu Design

*A: Title Section*

This section provides you with the system name and the default drive name. It also provides you with information on the version number and date. The version number of PCGEMS as a whole may be different from individual component programs since components are updated individually, as the need arises and since it is rare that the whole PCGEMS system is updated at the same time. You may, therefore, have a different date and version number than that indicated in this user's guide for individual components.

*B: User Interaction Section*

This section is also called the MAIN WINDOW in the Color Specification Menu (Figure 1-4). This section is where the main user interaction occurs in all types of menus. Navigational menus like the one shown above have a list of options, while parameter editing menus have a list of prompts with values or blank boxes attached to them requiring you to either enter new values or accept default values. Array editing menus have no prompts; instead, the related default data values or blank boxes are arranged in rows with headings denoting the value

types. You must fill in these blanks with appropriate information before proceeding to the next menu. Table selection menus require no data values from you. They usually display rows of variable names or program names or data values from which you may select any or all of the displayed items. To move in any direction in these menus, use the arrow keys on your numeric keyboard. (Note: For navigational menus, you cannot use the left and right arrow keys). The cursor location is highlighted.

The help messages are also shown in this section, appearing in a window whenever you press the Help key (F1 key). The command keys and the help messages are explained in Subsection 1.6 of this chapter. Help messages are available for all prompts or options in all menus in PCGEMS. Use them if you have the slightest doubt about what to enter. They will provide you with detailed information about the prompt on which your cursor rests.

*C: Error Message Section*

The third section is the error message area. If you do make an error in entering any input or if the program or dataset is not located in the file path that you specified in the configuration file, a message will appear in this area of the screen to tell that you have made an error and the type of error that you made. It is usually accompanied by a warning bell.

*D: Instruction Section*

This is the user message section. This part of the menu is used to advise the user about how to navigate the menu, and any limitations. All operational instructions and acceptable user responses are displayed in this section. Special user input such as entering “YES” and “NO” in response to questions such as whether or not you wish to exit after you enter the EXIT function key (ESC) are also described in this section. Refer to this section to see how to select items and how to move from that particular menu to the next one.

*E: Command Key Description Section*

The fifth and last area of the PCGEMS menu is the command keys section. It provides a list of the keys and their functions in PCGEMS. However, you should keep in mind that certain programs, such as the catalog manager, require

additional commands which are shown to you both in the PCGEMS instruction section and in this section. If you do run into any program or entry error, you should consult the instruction section as well as the error message section. The function keys available in this section are explained in Subsection 1.6 of this chapter.

The difference between the four menu types, as explained briefly before, lies mainly in the user interaction section. Each menu has a different format for the default data shown in this section (and the data required from you).

#### *Navigational Menus*

Navigational menus help you navigate through PCGEMS. They list the available options from which you may select by using the arrow keys to highlight the selection, then pressing the ENTER key. When you select an option, you will proceed either to another navigational menu or to a parameter editing menu. To get to certain environmental modeling programs, you may have to go through several navigational menus. All PCGEMS programs are selected from navigational menus. The menu shown in Figure 1-6 is a good example of a navigation menu.

#### *Parameter Editing*

Parameter editing menus are used to enter values into PCGEMS for specific parameters needed by a PCGEMS program in its execution. They require input from you in some way, either through acceptance of default values or entry of new values for parameters presented to you. If the parameter value must be entered by you, there will be no default value attached to that parameter. Figure 1-2 is a good example of a parameter editing menu.

#### *Array Editing*

Array editing menus are similar to parameter editing menus in that they require input necessary for the execution of the program. This input is in the form of tables. Array editing menus are different from parameter editing menus in that they are arranged in rows of related data values with headings illustrating the type of data values that you must enter. To move right, left, up and down in these menus, use the appropriate arrow keys on your keyboard. An example of an array editing menu is shown below in Figure 1-7.

GRAPHICAL EXPOSURE MODELING SYSTEM					U2.0	OCT 1, 1994	DRIVE: S
Monthly Climate Data for Year 1						Page 1 of 2	
Month	TA	NN	S	A	REP		
OCT	14.27	0.45	0.7	0.17	0.		
NOV	8.11	0.55	0.7	0.2	0.		
DEC	2.27	0.55	0.7	0.23	0.		
JAN	1.16	0.5999	0.7	0.24	0.		
FEB	2.05	0.5999	0.7	0.25	0.		
MAR	6.38	0.5999	0.7	0.23	0.		
APR	12.44	0.55	0.6	0.17	0.		
MAY	17.77	0.55	0.7	0.17	0.		
JUN	22.33	0.5999	0.7	0.17	0.		
JUL	24.66	0.55	0.7	0.17	0.		

Use arrow keys to select the array element to edit, and  
 Tab/Shift-Tab to move to the right and left data fields.  
 Press the ENTER key to proceed to next menu or operation.

F1:HELP F2:CMDS F3:LIST F9:BACK F10:NEXT PgUp/PgDn:PAGE Alt-F10:END Esc:EXIT

Figure 1-7. Example of Array Editing Menu

#### Table Selection

The fourth and last kind of menu is the **table selection** menu. You will see this menu if you select programs such as the Census program. This menu lists all available variables, parameters, or program names in a tabular form. Instead of entering data as in the other menus, you must pick the items of interest from those displayed. To select a certain variable, you must bring the cursor to the appropriate item and type "S" from the keyboard. When selected the item will automatically be highlighted. If you wish to select all the variables in the menu, press the ENTER key without selecting any items. All the items will be highlighted to indicate that you have selected all the items on the menu. An example of a table selection menu is shown below in Figure 1-8.



GRAPHICAL EXPOSURE MODELING SYSTEM		U2.0	OCT 1, 1994	DRIVE: S								
<div style="border: 1px solid black; padding: 10px; margin: 10px;"> <p style="text-align: center;">SELECT KEY VARIABLES</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%;">STATEFIPS</td> <td style="width: 25%;">COUNTYFIPS</td> <td style="width: 25%;">PLACECODE</td> <td style="width: 25%;">BLOCKGROUP</td> </tr> <tr> <td>LONGITUDE</td> <td>LATITUDE</td> <td></td> <td></td> </tr> </table> </div>					STATEFIPS	COUNTYFIPS	PLACECODE	BLOCKGROUP	LONGITUDE	LATITUDE		
STATEFIPS	COUNTYFIPS	PLACECODE	BLOCKGROUP									
LONGITUDE	LATITUDE											
<div style="border: 1px solid black; padding: 5px; margin: 10px;"> <p style="text-align: center;">Press S for selection toggle (HIGHLIGHT = SELECTED).</p> <p style="text-align: center;">Use arrow keys to move LEFT, RIGHT, UP, and DOWN.</p> </div>												
<p>F1:HELP F2:CMDS F3:LIST F9:BACK F10:NEXT PgUp/PgDn:PAGE Alt-F10:END Esc:EXIT</p>												

Figure 1-8. Example of a Table Selection Menu

## 1.6 Command Keys and Help Messages

PCGEMS has its own set of command keys, many of which are keyboard function keys. These keys allow you to navigate within menus and from menu to menu, and provide you with help or information about the system. Command keys that allow you to move through the system include F10, F9, ENTER and ESC. The arrow keys are used to move up and down within a menu. The arrow keys may also be used to move left and right when the parameter entry involves arrays. Help or information keys include F1, F2, and F3. The universal PCGEMS commands are described below.

- F1* This key retrieves help from the system for the item on which the cursor rests. Help messages exist for every item in every menu. The help messages vary in degree of information given. Generally, the help messages give information on the type of response called for by a specific item if it is part of a parameter editing menu or array editing

menu, or general information if it occurs in a navigational menu or table selection menu.

- F2* Pressing this key generates a list of command keys and a brief explanation of their functions.
- F3* This key calls up the active catalog file. This catalog file lists the input and output datasets generated by any of the programs in PCGEMS. (Do not confuse this with the catalog manager, which is listed under the Data Management Option in your main menu. The catalog manager allows you to update or change any of the entries in your current catalog and must be accessed using PCGEMS menus.) While the F3 key does not allow users to modify files, it does permit users to change the active catalog, into which PCGEMS output files are stored. To see the catalog files available in your directory, enter "A". You will see a table selection menu listing all the catalog files in your directory with the active catalog file highlighted. To select any of the catalog files, move your cursor to the appropriate catalog and press "S". You may also select a new catalog file by selecting the entry called "[NEW]". Changing the active catalog allows you to assign a specific file catalog to a specific program that you plan to use often. Remember, however, that you should change the active catalog **before** the output files are created. To scroll up and down the catalog, use the arrow keys. If your file is especially large, use the HOME key to go to the top of the file and the END key to go to the end of file. To return to your current menu after viewing the catalog, press the F3 key again.
- F9* This command key moves you back to the previous menu. If you are in the middle of a particular PCGEMS program, this function allows you to return to the first parameter editing menu in the program. It will not allow you to escape from a program. (To end a program, use the ALT/F10 command.)
- F10* This command key allows you to select an item in a navigational menu after you have positioned your cursor over it. Users may position the cursor with arrow keys or by entering the item number. In other types of

menus, this key is used to proceed to the next menu, after values for all required parameters have been entered. It performs the same function as the ENTER key.

- ALT/F10* This command allows you to end a program and return to the previous navigational menu screen. When you are in the middle of a program and wish for some reason to abort it and return to a navigational menu, this is the only way to do so without exiting PCGEMS completely. You may also use this command to return to the main PCGEMS menu from any navigational menu at any level.
- ESC* To exit from PCGEMS, use this function key. You will be asked whether you really wish to exit and you must answer "Y" for Yes before you may exit. This is to ensure that you did not accidentally hit the function key.
- PgDn* This command key allows you to move down a page when the menu has multiple pages.
- PgUp* This command key allows you to move up a page when the menu has multiple pages.

There are a few additional commands not listed here that exist within specific programs of PCGEMS. These commands will be discussed in the sections in this manual on specific programs.

*Remember, when in doubt, use the HELP messages; when you make an error, read the error message carefully; and when you want to move on, read the instruction section.*

---

## 1.7 Correcting and Reporting Bugs

Although PCGEMS has undergone extensive testing before release, the possibility exists that some software malfunction may occur. If you find the system has a problem, please report it to:

*Ms. Lynn Delpire, 7406  
U.S. EPA  
401 M Street, S.W.  
Washington D.C. 20460  
Tel. No. (202) 260-3928*

Before you report a problem, make certain that you answer “Yes” to each of the following questions:

1. Are you running PCGEMS on an IBM PC/XT/AT or compatible machine?
2. Are you operating with a DOS version 2.2 or higher?
3. Are you operating with a graphics board?
4. Have you followed the loading instructions in Subsection 1.3 to the letter?
5. Have you loaded the ANSI.SYS driver into your CONFIG.SYS file (only for the ReachScan Model)?

If you answered “YES” to all five questions but are still experiencing problems, check the CONFIG.SYS file next. We recommend that you have no memory-resident programs in your CONFIG.SYS file. If you retain memory-resident programs, then there is a good chance that certain programs in PCGEMS will not work. Retain memory-resident programs at your own risk. Since PCGEMS is a highly memory-intensive system, it will not work on networks.

When reporting a “bug”, include as much detailed information as possible about the problem, including a complete description of the equipment on which the system was running at the time. If possible, include a “screen-print” of the system display at the time of the problem. Also include your daytime telephone number so that we may call you if we have questions.

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## Contents

1. General Information .....	1-1
1.1 GEMS and PCGEMS: Interactive Relationship .....	1-3
1.2 Minimum System Requirements .....	1-5
1.3 Loading PCGEMS .....	1-6
1.4 Starting PCGEMS from the Hard Disk .....	1-27
1.5 Menu Design .....	1-27
1.6 Command Keys and Help Messages .....	1-32
1.7 Correcting and Reporting Bugs .....	1-35

---

**Figures**

Figure 1-1. System Herald .....	1-21
Figure 1-2. Selection of Graphics Mode Menu .....	1-22
Figure 1-3. Path Specification Menu .....	1-23
Figure 1-4. Color Specification Menu - Page 1 .....	1-25
Figure 1-5. Color Specifications Menu - Page 2 .....	1-25
Figure 1-6. Example of PCGEMS Menu Design .....	1-28
Figure 1-7. Example of Array Editing Menu .....	1-31
Figure 1-8. Example of a Table Selection Menu .....	1-32

## Index

AT123D (1-13)

Bernoulli Box (1-5)

CAS Number (1-19)

Catalog Manager (1-3)

CATMGR (1-15)

CENSUS (1-14)

    Census Block (1-18)

Communications

    list of programs (1-16)

CORE

    communications programs (1-16)

    data management programs (1-14)

    system programs (1-10)

    utilities programs (1-16)

COUNTIES.BIN (1-18)

CRFIG (1-16)

Data Management

    list of programs (1-14)

Dataset

    GEMS CHEMEST (1-18)

    Geographic Mapping Boundary (1-18)

Directory Tree (1-9)

DXDYCALC (1-17)

ENPART (1-14)

Environmental Modeling

    list of programs (1-12)

Estimation

    list of programs (1-11)

EXAMS-II (1-13)

File Conversion (1-3)

FIPS.BIN (1-18)

GEMS (1-1)

    access on VAX (1-2)



- GEMS CHEMEST (1-18)
- GENMAP (1-16)
- Geographic Mapping Boundary (1-18)
- Graphics
  - list of programs (1-15)
- Installation (1-6)
- ISCLT (1-12)
- Loading (1-6)
  - programs (1-8)
- Menu Tree (1-8), (1-11), (1-12)
- Modem (1-5)
- MS-KERMIT (1-3), (1-16)
- PCCHEM (1-11)
- PCFAP (1-12)
- PCGEMS (1-2)
  - access to GEMS (1-3)
  - features unavailable (1-3)
  - Loading (1-6)
  - menu tree (1-8)
- PCGEMS Datasets
  - list (1-17)
- PCHYDRO (1-11)
- PCLOGP (1-11)
- Programs
  - communications (1-16)
  - CORE (1-10)
  - data management (1-14)
  - directory tree (1-9)
  - environmental modeling (1-12)
  - estimation (1-11)
  - graphics (1-15)
  - menu tree (1-11), (1-12)
  - utilities (1-16)
- PTPLU (1-12)
- Reach Trace (1-18)
- REACHSCAN (1-14)

REGION.BIN (1-18)  
ROSE (1-15)  
SESOIL (1-12)  
SMIGET (1-11)  
SMILES (1-19)  
STAR (1-19)  
STATES.BIN (1-18)  
System Requirements (1-5)  
US.BIN (1-18)  
Utilities  
    list of programs (1-16)  
VAX Cluster (1-2)  
    opening an account (1-4)  
XDIR (1-14)  
XEDITOR (1-15)  
XEDTFILE (1-15)  
XFORMAT (1-15)  
XINSTALL (1-16)  
XRUN (1-17)  
XRUNNPC (1-17)